MORTALITY IN INFANCY AND CHILDHOOD IN INDONESIA*

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ABSTRAK

Telah dilakukan analisa dan ulasan dari beberapa makalah dan laporan hasil penelitian yang berkaitan dengan kematian bayi dan anak Balita (1–4 tahun).

Survai Kesehatan Rumah Tangga 1980, mendapatkan angka kematian anak di bawah umur 5 tahun adalah 24.1 per 1000 anak. Pola penyakit penyebab kematian yang prevalen adalah diare yang mencakup 1500.1 kematian bayi per 100.000 bayi lahir hidup dan pada anak 1–4 tahun adalah 416.6 per 100.000 anak. Tetanus didapati pada 1296.7 kematian per 100.000 bayi lahir hidup dan pada anak 1-4 tahun, adalah 321.5 per 100.000 anak. Anak-anak di bawah umur 5 tahun yang sakit dalam waktu 1 bulan adalah 186.0 per 1000 anak, diantaranya 53.1 per 1000 anak menderita penyakit infeksi dan parasit.

Penelitian secara prospektif tentang kelahiran dan kematian bayi dan anak 1–4 tahun di Sukabumi, pada tahun 1982/1983, menghasilkan pola penyakit penyebab utama kematian bayi dan anak. Pertama adalah penyakit yang dapat dicegah dengan immunisasi, kedua adalah penyakit diare yang prevalen pada bayi. Berat badan lahir rendah didapati pada 11.1% dari seluruh bayi lahir hidup.

Penelitian Morbiditas, Mortalitas perinatal dan berat badan waktu lahir telah dilakukan di Kabupaten Bandung dan R.S. Hasan Sadikin pada tahun 1978–1980. Angka lahir mati adalah 13.7 dan kematian neonatal dini 34.2 per 1000 kelahiran hidup di Ujung Berung. Berat badan rendah meliputi 14.7% dari seluruh bayi yang dilahirkan. Kematian perinatal didapati dua kali lebih tinggi pada kelompok bayi yang dilahirkan dengan berat badan kurang dari 2500 gm, dibandingkan dengan kelompok bayi yang dilahirkan dengan berat badan 3000–3999 gm. Umur ibu waktu melahirkan mempengaruhi berat badan waktu lahir, di Ujung Berung pada ibu golongan umur dibawah 20 tahun didapati 22.2% bayi dengan berat badan lahir rendah, dan di R.S. Hasan Sadikin didapati 27.9% bayi dengan berat badan lahir rendah.

Pada 12 rumah sakit rujukan dan pendidikan, telah dilakukan monitoring ibu hamil, 1978–1980. Kematian perinatal didapati rendah (3.5–3.9%) pada kelompok bayi dengan berat badan waktu lahir 3000–3999 gm, sedangkan pada kelompok bayi dengan berat badan waktu lahir kurang dari 2500 gm, kematian perinatal meliputi 30.0%. Pendidikan ibu, pemeriksaan pada waktu hamil dan kesehatan ibu mempengaruhi kematian perinatal.

The purpose of this report is to review the available vital statistics on mortality in infancy and childhood and make proposals for progress in providing statistics as the basis for health programs for the rapid reduction of mortality in this important age group. Data from the Household Health Survey of 1980[1,2], perinatal mortality studies[3–9] and the prospective study in Sukabumi Regency are summarized.[10]

According to estimates of the Central Bureau of Statistics[11] the crude birth rate was 35.0 and the death rate 12.2 per 1000 population for 1975–1980. Infant mortality[12] was estimated to be

*) Revision of a paper presented by the first author at a Seminar on October 19, 1983 at the National, Institute for Health Research and Development, Ministry of Health, Jakarta, Indonesia.

107 per 1000 live births in 1980 and varied from 62 in D.I. Yogyakarta to 187 in Nusa Tenggara Barat. Life expectancy, estimated from the 1980 Census, was 52 years.

HOUSEHOLD HEALTH SURVEY

The reports of the Household Health Survey of 1980, conducted by the Health Ecology Research Center provide useful data in nine fields. These include causes of morbidity and mortality which will be utilized for this report. Several publications [1,2,13] have been released with tables of data in these fields. Also tabulations and unprocessed data are kept on tapes in the Center and serve for special studies and research.

For planning of health programs for the reduction of mortality—especially in infancy and childhood—it is essential to know the causes of death and death rates for preventive action. This Household Health Survey was unique in that medical interviewers obtained the causes of deaths occurring in the year preceding the survey. Newly graduated doctors and medical interns were trained to carry out the interviews, observations and physical examinations. Although current reporting of causes of all deaths gives a more complete account, a survey can provide causes for the deaths which occured in the existing households and were remembered. For example, the death of the last surviving member of a household would not be included. Also, deaths occurring soon after birth may not be remembered by the family or the traditional birth attendant may have considered deaths which occur a few minutes or a few hours after birth as stillbirths. Levels of mortality are known to be higher than those obtained in retrospective surveys. However, this household survey was valuable as physicians obtained the histories of illnesses or injuries leading to death. The analyses of death rates from specific causes and comparisons with death rates in other areas aid in the interpretation of health problems. All developing countries have under-reporting of deaths and even developed countries may fail to obtain all. The serious problems are evident as well as the need for current data on causes of death with rates in early life-especially in infancy.

Causes of death were classified according to a slightly expanded version of the B List of the International Classification of Diseases, Eighth Revision of the World Health Organization[14]. Death rates by causes in infancy and childhood are presented in Table 1 for Indonesia and for one of the projects, Recife, Brazil, of the Inter–American Investigation of Mortality in Childhood[15]. This project was in a developing area in Northeast Brazil. The death rate of infants (under 1 year of age) in Indonesia was obviously too low. The death rate in the first month of life, 25.9 per 1000 live births was much lower than the comparable rate for Recife of 35.3. This lower rate is due to the difficulty of finding deaths in the first few days of life due to perinatal conditions in a survey. However, the comparison of death rates by causes in Indonesia with those in an area with relatively high similar rates is useful.

The total death rate for those under 5 years of age in Indonesia was 24.1 per 1000 population in contrast to 29.3 in Recife. The rate for Indonesia would have been higher if all the neonatal deaths were remembered and reported. The rate for children 1–4 years of age of 12.1 per 1.000 population in Indone-

sia was higher than the rate of 9.0 in Recife.

The infant death rate from the group of diarrheal diseases and other intestinal diseases of 1500.1 per 100.000 live births was much higher than the rate for children 1–4 years of age, 416.6. Thus the program of prevention of deaths from dysenteries and diarrheal disease must place great emphasis on infants in early life. This point is stressed as some reports in the past have placed emphasis on diarrheal diseases in one-year old children. The data in Indonesia and those in the Investigation indicate the highest death rates in infancy.

Several programs include measures which aid in reducing the number of infants susceptible to death from diarrheal disease. These include the improvement of the nutritional state of the pregnant women to prevent low weight babies and encouragement of breast feeding to provide some protection to the infant. Oral rehydration is needed also for prevention of deaths in infancy and childhood.

Table–1. Causes of Deaths with Rates per 100.000 Population for Children under 5 Years and 1–4 Years and for Infants per 100 000 Live Births in Indonesia Household Health Survey, 1980, and Recife, Brazil of Inter-American Investigation, 1968–1970.

Cause of Death	Indonesia Household Survey						Recife, Brasil		
	Under 5 years Deaths	Rate	Under 1 year Deaths	Rate	1-4 years Deaths	Rate	Under 5 years Rate	Under 1 year Rate	1–4 years Rate
All causes	413	2414.5	253	6432.7	160	1212.0	2933.6	9121.7	899.7
Infective and parasitic diseases	196	1145.9	123	3127.4	73	553.0	1556.8	4641.4	540.7
Typhoid fever 001	7	40.9	2	50.9	5	37.9	–	–	–
Diarrheal and other intestinal diseases 000, 002–009	114	666.5	59	1500.1	55	416.6	1037.0[a]	3792.8[a]	137.8[a]
Tuberculosis 010–019	–		–		–	–	50.8	59.2	47.0
Diphteria 032	6	35.1	2	50.9	4	30.3	23.4	29.6	20.9
Whooping cough 033	–	–	–	–	–	–	25.0	52.6	15.7
Tetanus 037	55	321.5	51	1296.7	4	30.3	23.4	88.8	2.1
Measles 0.55	3	17.5	1	25.4	2	15.2	320.4	427.6	278.7
Other, Rest of 000–136	11	64.3	8	203.4	3	22.7	76.7	190.8	38.6
Malignant neoplasms 140-209	5	29.2		127.1	–		5.6	3.3	6.3
Nutritional deficiency 260–269	2	11.7	1	25.4	1	7.6	118.6	154.6	104.4
Meningitis 320	41	239.7	19	483.1	22	166.6	33,9[b]	72.4[b]	20.9[b]
Influenza and pneumonia 470-486	100	584.6	55	1398.4	45	340.9	288.1	871.7	96.0
Intestinal obstruction and hernia 550–553, 560	5	29.2	5	127.1	–		13.7[c]	42.8[c]	4.2[c]
Congenital anomalies 740-759	4	23.4	3	76.3	1	7.6	97.7	365.1	10.4
Certain perinatal causes 760-778	23	134.4	23	584.8	–		585.1	2384.9	
All other diseases	7	40.9	3	76.3	4	30.3	152.5	394.7	72.0
Symptoms and ill-defined 780-796	21	122.8	13	330.5	8	60.6	45.9	144.7	13.6
External causes N800–N999	9	52.6	3	76.3	6	45.4	35.5	46.1	31.3

* Categories of Eighth Revision of *International Classification of Diseases.*

(a) Categories 000–009; (b) Categories 320–324; (c) Categories 520–577

Source: Ratna Budiarso[2] and Puffer[15]

Diphtheria caused six deaths, two in infancy and four in children 1–4 years of age. No deaths were reported to be due to whooping cough and only three to measles. Some deaths from these causes may have occurred and been reported as due to pneumonia.

The tetanus death rate was very high in Indonesia, 1296.7 per 100.000 live births in infancy or 13.0 per 1000 live births. For those under one month of age, the death rate was 11.2 per 1000 live births. From the data for deaths in the one month preceding the survey (the best recall period), the tetanus death rate in the first month of life was 27.4 per 1000 live births. Thus these high death rates from tetanus indicate one of the most serious problems which can be solved by immunization of women of reproductive age.

Perhaps an administrative change in procedures of tetanus vaccination can be undertaken. A health officer reported that 70 percent of the children were vaccinated with BCG but only 15 – 20 percent with DPT. When asked for the reason for the difference, he said that BCG was given in schools and thus the children could be reached. As suggested by some of the research staff, perhaps the school girls who will be married soon after leaving shool could be given tetanus toxoid and told of the value of a booster dose before or during pregnancy. Neonatal and infant mortality could be reduced substantially by elimination of deaths due to tetanus.

The relatively high death rates from meningitis in infants and children 1–4 years of age in Indonesia require further investigation such as can be done in a hospital study. The causes of the meningitis need to be determined as the basis for preventive action.

The death rates from influenza and pneumonia were unusually high in infancy and childhood. Probably in the prospective study and by emphasis on obtaining the underlying causes of death as recommended in the International Classification of Diseases, some of such deaths will be found to be the terminal event with an infectious disease as measles, whooping cough, diphtheria or tuberculosis as the underlying cause. This was the experience in the Investigation in Latin America.

The death rates from congenital anomalies and perinatal causes were low in Indonesia and will be found to be higher by current reporting of deaths. These are usually the deaths which are forgotten.

The section of the health survey of diseases and conditions diagnosed in the month preceding the survey is especially valuable. The causes of these illnesses are given in detail in the report[2] for 82 categories of an expansion of the C List of the International *Classification of Diseases* of WHO and should be used in health planning.

As given in Table 2, 13.929 cases of diseases were diagnosed as causes of illnesses during the month preceding the survey. The total cases for persons of all ages was 114.9 per 1000 population. However, for children under 5 years of age, the rate of 186.0 was much higher. Since the infective and parasitic diseases are responsible for high death rates, these case rates are given also in table 2. The infective and parasitic diseases were causes for the case rate of 53.1 per 1000 population for children under 5 years of age over twice the rate for persons of all ages.

Table – 2. Cases of Diseases Diagnosed in Month Preceding Survey and Infective and Parasitic Diseases for All Ages and Children under 5 years with Rates per 1000 Population, Indonesia, 1980.

Age group	All Causes		Infective and parasitic diseases	
	Cases	Rate	Cases	Rate
All ages	13.929	114.9	3.004	24.8
Under 5years	3.182	186.0	909	53.1
Under 1 yer Under 1 Year	616	157.8	173	44.3
1–4 years	2.566	194.4	736	55.8

Source : L. Ratna P. Budiarso[2])

The survey provided data on the causes of these cases with rates by age group. Some of the high rates were puzzling in terms of causation. Influenza and pneumonia were responsible for the highest rate, namely 19.0 per 1000 population, and other respiratory infections had the second highest rate. Probably some of the respiratory cases followed infectious diseases. This may apply especially to the high rates for children under 5 years.

Figure 1. Cases of Diarrheal and Other Intestinal Disease and Influenza and Pneumonia per 1000 Population by Age Group Household Survey, Indonesia, 1980

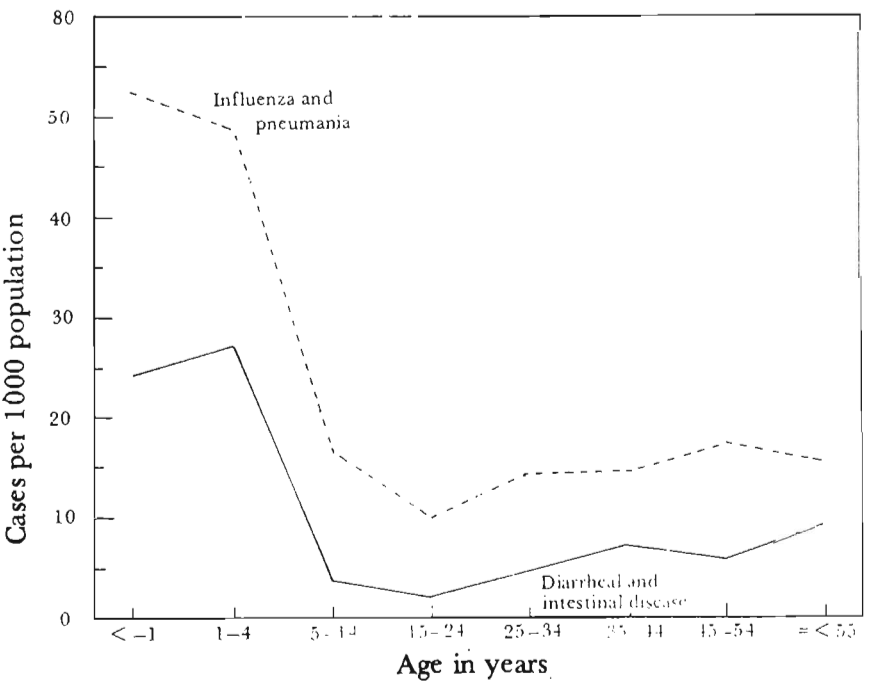
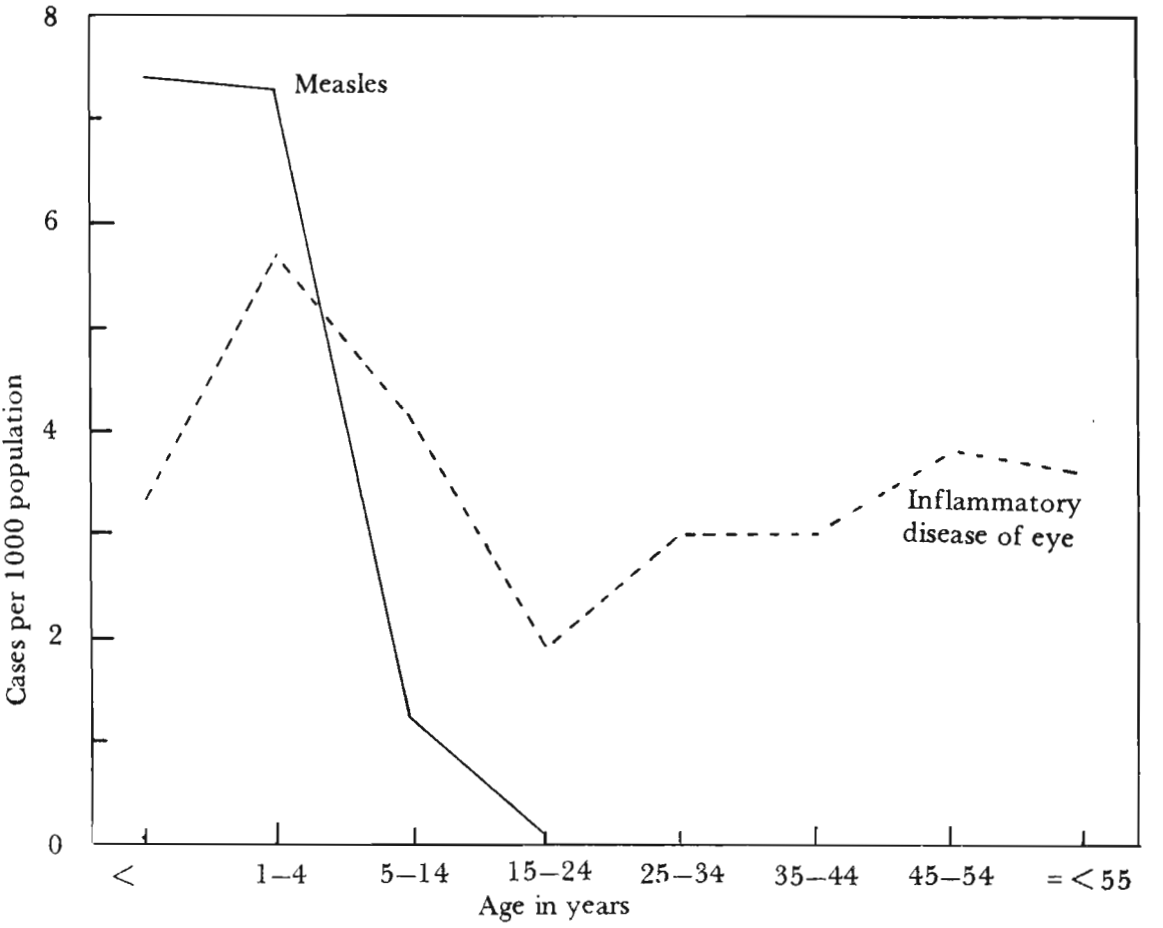


Figure 2. Cases of Measles and Inflammatory Diseases of Eye per 1000 Population by Age Group. Household Survey. Indonesia 1980



To emphasize the usefulness of this material, the case rates for eight diseases or groups of deseases are presented in Table—of and the rates for four are shown in Figures I and II. Of these diseases, several have high rates in infancy and childhood. For example, the case rates for diarrheal and other intestinal diseases was very high for infants and children 1–4 years of age However, as noted from Table 1, the death rate from diarrheal and other intestinal diseases for infants was 3.6 times the death rate for those 1–4 years of age. Further research should determine whether those who die so early in life are immature or have malnutrition. These multiple factors have been found to be responsible for high death rates from diarrheal disease in the develop ing countries of the Americas.

Table–3. Eight Diseases or Groups of Diseases Diagnosed for Month Preceding Household Survey by Age Group with Rates per 1000 Population, Indonesia, 1980.

Age group	Diarrheal and intestinal disease 004, 006, 008 009		Tuberculosis 010 – 019		Measles 055		Inflammatory disease of eye 360–369	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total	929	7.7	732	6.0	168	1.4	427	3.5
Under 1 year	96	24.6	5	1.3	29	7.4	13	3.3
1–4 years	359	27.2	31	2.3	96	7.3	75	5.7
5–14 Years	121	3.6	39	1.2	41	1.2	138	4.1
15–24 years	48	2.1	44	2.0	2	0.1	43	1.9
25–35 years	74	4.5	59	3.6	0	0.0	50	3.0
35–44 years	97	7.2	130	9.6	0	0.0	40	3.0
45–54 years	56	5.8	168	17.4	0	0.0	37	3.8
55 – years and over	78	9.2	256	30.1	0	0.0	31	3.6

Age group	Acute respiratory infections 460–466		Influenza and pneumonia 470–846		Bronchitis, emphysema and asthma 490–493		Diseases of skin and subcutaneous tissue 680–709	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total	1272	10.5	2357	19.0	944	8.8	1084	8.9
Under 1 year	90	23.1	204	52.3	20	4.1	75	19.2
1 – 4 years	364	27.6	641	48.6	125	9.5	345	26.1
5 – 14 years	321	9.6	558	16.6	110	3.3	289	8.6
15 – 24 years	141	6.3	221	9.9	49	2.2	77	3.4
25 – 34 years	109	6.6	237	14.3	464	3.9	62	3.7
35 – 44 years	92	6.8	196	14.5	119	8.8	74	5.5
45 – 54 years	78	8.1	168	17.4	169	17.5	70	7.3
55 years and over	77	9.1	132	15.5	288	33.9	92	10.8

Source: L. Ratna Budiarso[2]

The case rates for measles were practically the same for infants and children 1–4 years of age, 7.4 and 7.3 per 1000 population respectively. These rates were much higher than for children 5–14 years of age indicating that cases of measles occur very early in life.

The cases rates from acute respiratory infections, influenza and pneumonia are higher in the infants and young children than in the older age groups. Two other groups of diseases are included in Tabel 3 to show that these were problems in infancy and childhood. These groups are diseases of the skin and subcutaneous tissue and inflammatory diseases of the eye.

Since the death rate from tuberculosis of 62.7 per 100.000 population was high, the case rates by age group are given in Table 3 to aid in understanding this problem. These case rates appear to increase with age to the highest case rates for those 55 years and over and indicate that tuberculosis is a problem in the older age groups rather than in young children.

In addition to the reported cases of these illnesses, the medical interviewers recorded "unperceived diseases" on their

visits to the households. While 732 cases of tuberculosis were reported, 115 other cases were recognized by these physicians with the largest number of persons in the age group, 55 years and over.

Many more cases of nutritional deficiency, inflammatory diseases of the eye, acute respiratory diseases and congenital anomalies were recognized. In all, 6.825 additional cases of which over one-third were of children under 5 years of age.

Thus these two sections of the Household Health Survey on causes of death and illnesses provide considerable and very useful information regarding health problems in Indonesia.

PROSPECTIVE STUDY OF BIRTHS AND DEATHS BY CAUSES IN SUKABUMI REGENCY

In 1982 and 1983, the Institute of Health Research and Development of the Ministry of Health of Indonesia conducted a prospective study as part of the research project "Studies on Health and Family Planning in ASEAN Countries", coordinated by ASEAN Population Coordination Unit, sponsored by the Australian Government. The prospective study of births and deaths with causes of deaths was carried out for a year in two subdistricts of Sukabumi Regency, Parakan Salak and Jampang Kulon, in West Java. A sound method was developed for collecting the basic vital statistics so essential for health planning at local, district and national level. The success of the study required the services of the staff of the local health centers and intensive training and supervision of local workers.

In the villages, heads of the communities with approximately 35 families were responsible for reporting births and deaths currently. The recording forms were written in the local language. Completed recording forms were collected by health workers. The health officer or a medical interviewer would visit the home and verify the death and obtain the causes leading to death. Data on births were reported by the traditional birth attendants and midwives who were usually elderly women. The delivery forms were designed with pictures to make recording of the delivery feasible. Portable spring balances with colored scales were provided beginning in April, 1983 for recording body weight at birth. A midwife from the local health center visited the mother and baby as soon as possible and completed the information regarding the birth.

Records of births and deaths for the year, September 1, 1982 through August 31, 1983 were collected currently[10]. The analyses of births and deaths were summarised in Table 4. Of the 683 deaths reported in the year of the study, 296 or 43 percent are of infants and children under 5 years.

Table – 4. Birth and Death Rates of Prospective Study in Sukabumi Regency, Indonesia, 1982–1983

Event	Number	Rate *
Live births	2.348	36.8
Total deaths	683	10.7
Stillbirths	68	28.1
Deaths 0–4 years	296	31.7
Infant deaths	176	75.0
Neonatal	90	38.3
Postneonatal	86	36.6
Deaths 1–4 years	120	14.2

* Birth and death rates per 1000 population, stillbirth rate per 1000 total births, death rate 0–4 and 1–4 years per 1000 population in age group, infant death rates per 1000 live births. Source: Ratna P. Budiarso [10]

For the first time in Indonesia, information collected currently is provided with causes of death by age group for a rural area of the country. Death rates in infancy and childhood from tetanus, measles and whooping cough are high indicating the need for immunization programs. Although the numbers of deaths are small, the measles and whooping cough death rates are higher in infancy than in children 1–4 years of age showing the need of the programs in infancy. The diarrheal disease death rates are high, especially in infants.

Of the 953 live births with birth weights, only 11.1 percent had low birth weights that is less than 2500 grams, and 17.5 percent were in the favorable weight group of 3500 – 3999 grams. Other data in Indonesia indicated also that the problem of low birth weights was much less and distinctly different from those in neighboring countries.

This sound method of collecting vital statistics for a specific area is suitable for other areas of the country. It requires the coordination and cooperation of several agencies and supervision and training of local personnel. Such programs could be undertaken in other developing countries. Vital statistics including death rates by causes are essential for health planning.

Birth Weight and Perinatal Mortality

One of the questions requiring attention in Indonesia relates to the size and nature of the problem of low birth weight. In 1980, the World Health Organization[16] released a report on the incidence of low birth weight utilizing published reports. In 1984, an update[17] of the first report was issued with revised data for 1982. The definition of low birth weight has been altered to less than 2500 as published in the Ninth Revision of the *International Classification of Diseases*[18] The estimated percentages of live births weighing less than 2500 grams are given in Table 5 for regions of the world.

Table – 5. Incidence of low Birth Weight Infants by Region of the World, 1982

Region	Percentage
The World	16.0
Africa	14.0
Northern America	6.8
Latin America	10.1
Asia	19.7
Europe	6.5
Oceania	11.6
Union of Soviet Socialist Republics	8.0

Source: World Health Organization[17]

The incidence of low birth weight among live births is estimated to be 16.0 for the world. The percentages are lower for Northern America and Europe of 6.8 and 6.5 respectively. For Asia, the percentage is very high, 19.7 with the highest of 31.0 for Middle South Asia. For Eastern South Asia, the percentage is 16.9 and for Indonesia 14.0. As low birth weight is considered an indicator of the health status of the population, studies are being undertaken to determine the incidence and causes of low weight births in Indonesia.

A very fine and well conducted study of low birth weight and perinatal mortality was carried out in Bandung in West Java[3-5]. The final results of the study which included three different population groups are presented in three volumes: Vol. III of Hospitals and Maternity Clinics in the Municipality of Bandung, Vol. IV of the Hasan Sadikin General Hospital, Bandung and Vol. V of Ujung Berung, West Java. A short summary of some of the highlights of these studies is given as they contribute to the understanding of health problems in infancy in Indonesia.

The experience of 25 registered hospitals and maternity clinics in the Municipality of Bandung[3] is large. Of the 13.080 total births, 77 were excluded because of birth weights of less than 1.000 grams in accordance with recommendations for studies of perinatal mortality. The hospitals reported for one year, the deliveries and the outcome with live births, stillbirths and early neonatal deaths on a form provided for their routine use.

In the experience of the Hasan Sadikin General Hospital[4] in Bandung, information was obtained regarding the pregnant women, outcome of pregnancy and each infant was followed up in the hospital, when possible, of the condition of the infant until the seventh day of life was reached. This large university teaching hospital is the main referral hospital of West Java and 723 of the 2.883 births were of referred cases. Thirty–six with a birth weight of less than 1000 grams were excluded.

A third study[5] of low birth weight and perinatal mortality was conducted in three villages, Cibiru, Cinunuk and Cileunyi of Ujung Berung. In this prospective study, pregnant women were followed from 28 weeks of pregnancy until the infant reached the 28th day of life. Five visits to each pregnant women and to her child were scheduled. The wife of the village head was expected to report concerning the pregnant women in her area and the traditional birth attedant regarding the delivery. The midwife visited the mothers within 24 hours after birth to have an accurately recorded birth weight. During the study, 2.342 infants were born of which 34 were stillborn. Those weighing less than 1000 grams were excluded from the analysis.

The stillbirth, early neonatal death (0–6 days) and perinatal death rates*) for these three studies are given in Table 6. As expected, because of the distinctly different types of studies, the rates vary widely. The study in Ujung Berung represents rural communities in West Java and differences in the social and economic as well as in the biological variables affect the problems. Since infant death rates are estimated to be high, probaby early neonatal death rates of 30–40 per 1000 live births would be expected, as was found in two of the studies.

The early neonatal death rate of newborns delivered in the 25 hospitals and clinic appears low. However, according to the report[3] "It was assumed that mothers included in this survey were from better socio-economic conditions, who can pay the high cost of hospital and private

maternity care delivery ..... " The high stillbirth and perinatal death rates in Hasan Sadikin General Hospital were probably due to referred cases. Perinatal deaths are stillbirths and early neonatal deaths (0–6 days). The exclusion of stillbirths of less than 28 weeks of gestation is recommended. Perinatal death rates are based on the total of stillbirths and live births.

The distributions of total births by birth weight in the three studies are given in Table 7 and are shown in Figure 111. The percentages of these births weighing less than 2500 gram varied from 8.99 in the 25 hospitals and clinics to 14.7 in the Ujung Berung community study to 17.5 in Hasan Sadikin General Hospital. In the General Hospital, the percentages of birth weights of 1000–1499 grams and 1500–1999 grams were higher than in the other two experiences which may be due to referred cases. The weight group with the highest percentages was 3000–3499 grams; 42, 40 and 36 percent of the births had those weights. In the weight group of 3500–3999 grams, the percentages were much lower, 14, 9 and 13.

Table – 6. Stillbirth, Early Neonatal and Perinatal Deaths and Death Rates* in Three Areas of Bandung Study, Indonesia, 1978–1980

	Hospitals and Clinics, Bandung		Ujung Berung West Java		Hasan Sadikin General Hospital	
	Number	Rate	Number	Rate	Number	Rate
Total births	13.003		2.337		2.883	
Stillbirths	164	12.6	32	13.7	247	85.7
Early neonatal deaths	97	7.6	79	34.2	99	37.7
Perinatal deaths	261	20.1	104	44.5	346	120.0

*) Stillbirth and perinatal death rates per 1000 total births and early neonatal death rates per 1000 live births.

Table – 7. Distribution of Total Births by Births Weight in Three Areas of Bandung Study, Indonesia, 1978 – 1980

Birth weight in grams	Hospitals and clinics, Bandung		Ujung Berung West Java		Hasan Sadikin General Hospital	
	Number	%	Number	%	Number	%
Total	13.003	100.0	2.337	100.0	2.883	100.0
1000–1499	90	0.7	24	1.0	58	2.0
1500–1999	192	1.5	38	1.6	127	4.4
2000–2499	875	6.7	282	12.1	320	11.1
Less than 2500	1.157	8.9	344	14.7	505	17.5
2500–2999	4.183	32.2	813	34.8	931	32.3
3000–3499	5.513	42.4	926	39.6	1.025	35.6
3500–3999	1.863	14.3	217	9.3	373	12.9
4000 and over	287	2.2	37	1.6	49	1.7

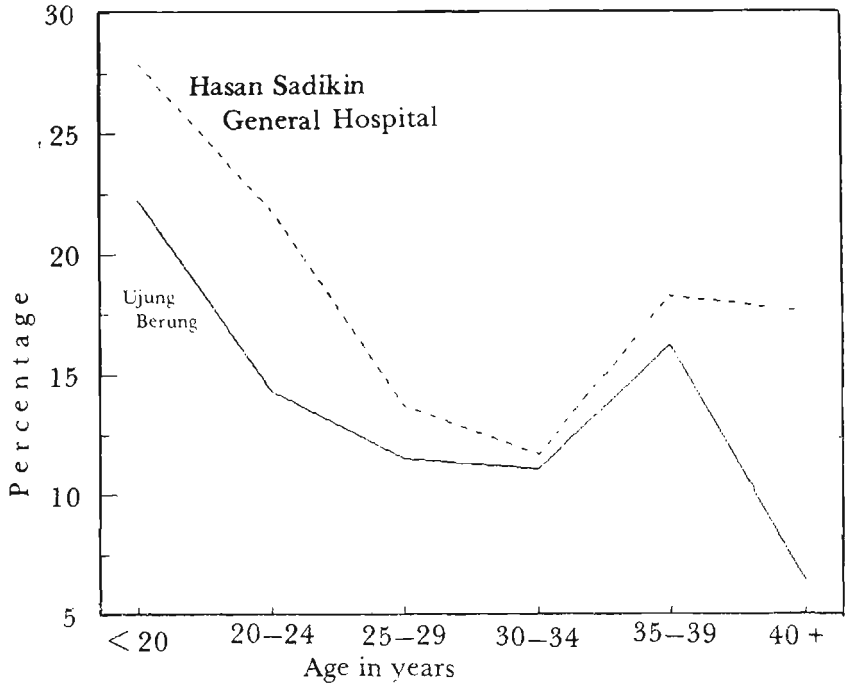
Source : Tanuwidjaja[3] and Alisyahbana[4–5]

*) Perinatal deaths are stillbirths and early neonatal deaths (0–6 days). The exclusion of stillbirths of less than 28 weeks of gestation is recommended. Perinatal death rates are based on the total of stillbirths and live births.

For evaluating these experiences and considering the problem of low birth weights as an important determinant in health planning, the findings in one of the projects of the Inter-American Investigation of Mortality in Childhood is shown in Figure III. The distribution of live births by birth weight in the

tively. The rate was over twice as high, 13.6 per 1000 total births for those weighing 2500–2999 grams, thereby indicating that the birth weights of 3000–3999 grams were more favorable for survival. Unfortunately, in the experience in Ujung Berung, these perinatal death rates were much higher. Of the perinatal

Figure 3. Percentage Distribution of Total Births by Birth in Three Areas of Bandung Study. Indonesia and California Project, U.S.A.



California Project[19] has been used. Of the 44.740 live births, 7.6 percent weighed 2500 grams or less. Although the same weight group, 3001–3500 grams, had the largest number of live births, as in Indonesia, in general there appeared to be a shift to the left, to lower birth weights in Indonesia.

Perinatal death rates have been analyzed by birth weight. For the 25 general hospital and clinic, the perinatal death rates were low for those weighing 3000–3499 and 3500–3999 grams at birth, 4.9 and 5.9 per 1000 total births respec-

deaths in this experience, 72 were early neonatal deaths and 22 of these deaths were due to tetanus neonatorum. This serious health problem of tetanus was partly responsible for these high perinatal death rates for babies whose birth weights were such that they should have experienced lower death rates.

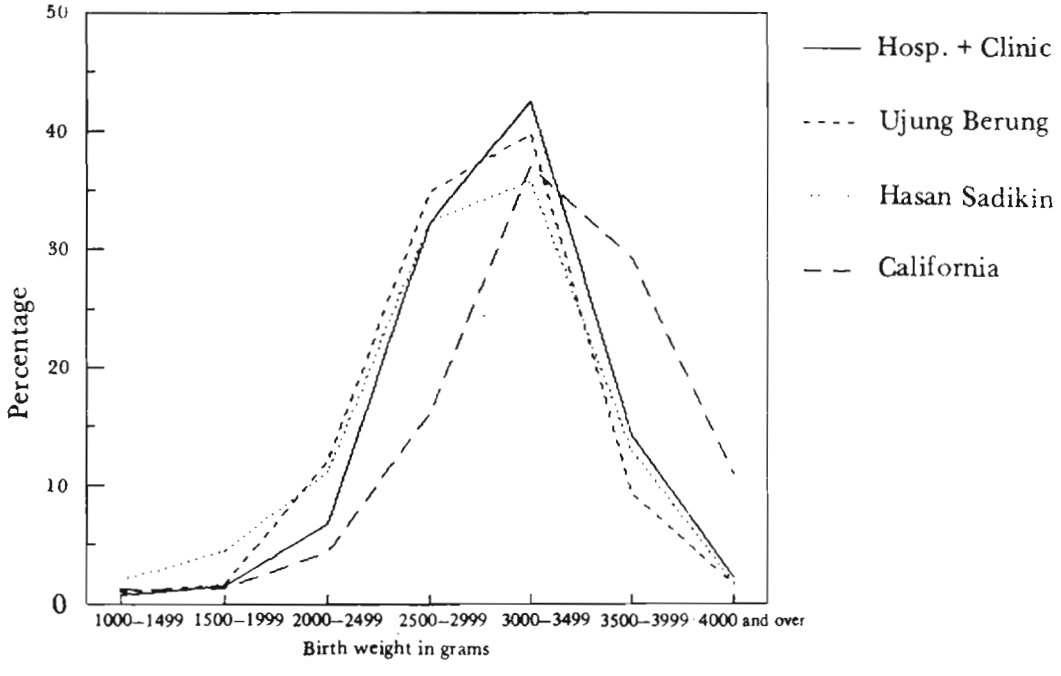
A large study of infant mortality was conducted in New York City[20] of a cohort of 142.017 live births. In this study, the infant death rates per 1000 live births were as follows for five weight groups:

2500 grams or less	140.5
2501–3000 grams	12.5
3001–3500 grams	7.7
3501–4000 grams	5.6
4001 grams and over	8.0

In this study, the infant death rate for babies weighing 2501–3000 grams was more than twice the rate for those with the lowest mortality, namely those weighing 3501–4000 grams. Infant mortality was low for those weighing at least 3001 grams. In the three areas of the Bandung study, 58.9, 50.5 and 50.2 percent of the births weighed at least 3000 grams and thus their birth weights were favorable for survival. In the New York study, 66 percent and in the California Project, 73 percent weighed at least 3001 grams. Increases in birth weights to favorable weights of at least 3000 grams appear to be advisable.

The age of the mother at delivery is another important determinant of the birth weight and thus of perinatal and infant mortality. The percentages of total births of low birth weight by maternal age are shown for Ujung Berung and Hasan Sadikin General Hospital in Figure IV. In Ujung Berung 441 or 18.8 percent of the mothers were less than 20 years of age and 22.2 percent of their babies were of low birth weight. In the Hasan Sadikin General Hospital, only 10.2 percent of the mothers were less than 20 years of age. For those under 20 years, 27.9 percent of their babies were of low birth weight. In both experiences, the lowest percentages were noted for babies of mothers in the age groups of 25–29 and 30 – 34 years of age.

Figure 4. Percentage of Total Births of Low Birth Weight by Age of Mother in Two Areas of Bandung Study. Indonesia, 1978 – 1980



A valuable contribution of the study in Ujung Berung was the establishment of size of the neonatal death rate (under 28 days of age). During the period of the study, 2.313 infants were born alive; however, only 1 744 were followed until the 28th day of life. Of the live births, including those weighing less than 1000 grams, who were followed for the first seven days, 79 died giving an early neonatal death rate of 34.2 per 1000 live births. Using this rate and the rate for those followed to the 28th day, neonatal mortality was estimated to be 51.6 per 1000 live births. This is a high neonatal death rate but in view of the high estimated rural infant death rate or West Java of 134 per 1000 live births, this neonatal rate is consistent and is evidence of the excessive mortality in this early age period.

Causes were obtained for 112 neonatal deaths and are given in Table 8. In order to compare the death rates from these causes with those in another experience in a developing country, the causes of the 112 deaths have been grouped according to the categories of the Eighth Revision of the *International Classification of Diseases*. The neonatal death rates by causes are compared with those in the Recife, Brazil Project of the Inter-American Investigation of Mortality[15]. The death rate from tetanus in Ujung Berung of 16.4 per 1000 live births is much higher than the rate of 0.7 in Recife.

The death rates from influenza and pneumonia, congenital anomalies and certain perinatal causes are similar in size to those in Recife. The higher death rate from diarrheal disease in Recife is probably due to the low proportion of the mothers who breastfed their babies. The prevention of tetanus would result in an important reduction of neonatal mortality in Ujung Berung.

Assessment of the high risks of low birth weight and perinatal mortality has recieved additional analyses by Alisjahbana[6]. She concluded with a statement that the socio-economic and

Table – 8. **Causes of Neonatal Deaths with Rates per 1000 Live Births in Ujung Berung, West Java, and Recife, Brazil Project of Inter American Investigation**

Causes *	Ujung Berung Number	Rate	Recife Brazil Number	Rate
Total	112	48.4**	1.073	35.3
Infective and parasitic diseases	52	22.5	198	6.5
Diarrheal disease 009	3	1.3	146	4.8
Tetanus 037	38	16.4	22	0.7
Other, Rest of 000–136	11	4.8	30	1.0
Influenza and pneumonia 470–486	4	1.7	59	1.9
Congenital anomalies 740–759	4	1.7	55	1.8
Certain perinatal causes 760–778	52	22.5	721	23.7
Other	0	0.0	40	1.3

* Categories in Eighth Revision of *International Classification of Deseases*

** With follow up of all until 28 days of age, the estimated neonatal death rate was 51.6 per 1000 live births

Source : Alisjahbana[5] and Puffer[15]

environmental factors particularly in Ujung Berung do not have a significant relationship with the perinatal death rate or the low birht weights. On the other hand, the biological factors have important relationships. Increasing the age of the mother before the first pregnancy, preventing pregnancy in the older age groups and birth spacing are important determinants for a favorable outcome of pregnancy.

MATERNITY CARE MONITORING IN INDONESIA

Maternity Care Monitoring (MCM) is an Indonesian development of the Indonesian Fertility Research and International Ferlility Research Program. This MCM program was directed by Sulaiman Sastrawinata and Agoestina. Data were collected from 12 obstetrical teaching and referral hospitals in Indonesia from 1978–1980. The Hasan Sadikin General Hospital in Bandung, which was one of the study areas used in the previous section of this report, was also one of the institutions included in this extensive and valuable study of perinatal mortality in Indonesia.

A Standard maternity record was used for the collection of the data which were processed by computer in the International Fertility Research Program of the Research Triangle Park in North Carolina, U.S.A. This MCM program has generated considerable data on birth weights, stillbirth, early neonatal deaths (deaths before discharge) and perinatal mortality in relation to a combination of variables. The analyses and publications are primarily for obstetricians and clinicians in teaching hospitals. However, many of the findings are very useful for health planning. They provide indicators of the high risk groups and of the actions which are advisable for the reduction of the incidence of low birth weights and perinatal mortality.

Some of the early findings were given in a paper by Bernard et al[7]. For five institutions, the following percentages of the singleton births were of low birth weight: Medan, 8.8; Jakarta, 17.8; Bandung, 15.9; Semarang, 13.4 and Manado, 8.3. The distribution of births in Medan was roughly similar to that in the California .Project with a relatively high proportion in the most favorable weight group, 3500 – 3999 grams.

From the tabulations from MCM–14, selected material is presented to illustrate the high risks. Table 9 gives stillbirth, hospital neonatal death and perinatal death rates, based on 36.778 singleton births by birth weight for 11 university centers.

Table – 9. Singleton Stillbirth, Hospital Neonatal Deaths* and Perinatal Deaths per 1000 Total Births by Birth Weight, Eleven Center Pool of Hospitals Indonesia, 1978–1980

Birth weight in grams	Stillbirth	Neonatal death	Perinatal death
Less than 2500	200.5	100.2	300.7
2500–2999	39.7	11.7	51.4
3000–3499	27.4	7.8	35.2
3500–3999	29.7	8.9	38.5
4000 and over	60.7	21.0	81.7

* Neonatal deaths are those before discharge

Source : Maternity Care Monitoring[8]

From these data, births with weights of 3000 – 3499 grams have the lowest stillbirth, early noenatal and perinatal death rates. Thus a goal of health planning would be to encourage weight gains in pregnancy so that the birth weight would be in this weight range.

The educational level of the mothers and the prenatal care received were important determinants of the outcome. Of the 36.778 women in this hospital experience, 8.527 or 23 percent has at least seven years of education. Among those having four to six prenatal visits, the perinatal death rate of their babies was 16.3 per 1000 total births and was even lower, 13.3 with seven or more prenatal visits. The perinatal death rates were much higher for the babies of women with less than seven years of education, 57.8 with one to three visits and 155.5 per 1000 total births with no visits.

A tabulation from the report[8] showed that with a hemoglobin level of below 10 g/100 ml at admission for delivery, the perinatal death rates were very high. If the level was less than or equal to 7 g/100 ml, the perinatal death rate was 386.9 and if 8g/100 ml, 134.6 per 1000 total births. Anemia of nutritional or infectious origin was considered an important cause of high perinatal mortality.

Although material for the analysis of perinatal mortality and birth weights by maternal age was not available, the following statement[9] was made; "In summary, maternal age—a biological risk factor—appears to be a crucial variable for the reproductive health status of these 36 302 women who delivered at the top referral institutions ....." The intermediate ages, that is 20–34 years, appear to be advisable for planning optimal reproduction.

These findings have been taken from a few of the documents available from this valuable research program. It is hoped that a summary from this material will be prepared of the many indicators of high risk pregnancies which could be utilized in health programs throughout Indonesia.

Several studies are being conducted on various aspects of the problems of morbidity and mortality in infancy and childhood which contribute in distinct ways to the establishment of indicators[21–27]

PROPOSALS FOR ACTIONS

Prospective studies of births and deaths by causes according to the methodology established in the two subdistricts in Sukabumi are proposed for several areas in the diverse parts of Indonesia. Urban as well as rural areas would be advisable so that, by the combination of results, they would serve as a registration area and vital statistics would become available for the country.

Pilot projects in the vital statistics program of BKKBN would be valuable Since efforts have been initiated and fertility/mortality data would serve for evaluating the family planning-nutrition program[28], the methodology of the Sukabumi prospective study could be utilized to secure complete registration of births and deaths. The directors of health centers would assist in this development. A few potential supervisors of reporting of births and deaths by village heads might be selected and trained to assist in this development as well as in the prospective studies suggested previously.

In addition to studies of perinatal mortality, longitudinal studies would be

valuable for extension of observations through the entire infant period. In order to understand the interrelationships of maternal nutrition and infant mortality, observations should begin with pregnant women of 28 weeks of gestation and extend through the first year of life of infants. The role of growth and development and infections of infants need to be evaluated in relation to the nutritional status of the mothers, including weight gain in pregnancy.

A recent working Group of United Nations and the World Health Organization[29] recommended special investigations of infant and child mortality in every country where levels of mortality are considered excessive. Several widely separated areas in Indonesia could be incorporated into such a geographical research project.

Another household survey may be advisable for evaluating the success of imunization, nutrition and other health programs for the reduction of mortality in infancy and childhood. Medicaly trained interviewers, who provided the quality of the data on causes of death and reports of illnesses in the household health survey of 1980, should be employed in another health survey. A more extensive survey with greater coverage of Indonesia would be advisable. The principles of medical certification and the rules for assignment of underlying causes of death according to the *International Classification of Diseases* of the World Health Organization would be followed by these medical interviewers.

An education and training program in health statistics would be valuable for all members of the health team. Classes on medical certification and vital statistics in their medical education would prepare the young health officers to promote birth and death reporting, and utilization of birth and death rates by causes in their program planning. One member of the staff of the health center could be trained to have responsibility for assisting village heads and community learders in developing the reporting system and for collecting and analyzing vital statistics and other health data.

For several of the suggested programs, training in the classification of underlying and associated causes of death according to the rules of the *International Classification of Diseases* of the World Health Organization is desirable. A WHO Collaborating Center for Classification is recommended for Southeast Asia. Whether the Center is located in Indonesia or a neighboring country, a training center in the International Classification is advisable in Indonesia.

Through the combination of actions proposed, it is hoped that in a few years Indonesia will have vital statistics data for local, national and international use and for inclusion and comparisons with other countries in the publications of the United Nations and the World Health Organization.

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